

Comparative field performances between conventional combine and mid-size combine in wetland rice cultivation

ABSTRACT

In paddy cultivation, harvesting is the most important operation, which needs suitable machinery. Thus, this study was carried out to compare field performances and energy and environmental effect between the conventional 5 m cutting width NEW HOLLAND CLAYSON 8080, 82 kW@2500 rpm combine harvester running on a total net area of 42.78 ha of plots for two rice (*Oryza sativa* L.) cultivation seasons and the new mid-size 2.7 m cutting width WORLD STAR WS7.0, 76 kW@2600 rpm combine harvester running on a total net area of 16.95 ha of plots for two rice cultivation seasons. The conventional combine as compared to mid-size combine showed 14.4% greater mean fuel consumptions (21.13 versus 18.46 l/ha), 31.1% greater mean effective field capacity (0.69 versus 0.53 ha/h), 5.23% greater cornering time (turning time) percentage of total time (8.28% versus 3.05%) and 1.41% greater reversing time percentage of total time (7.2% versus 5.79%) but 20.90% lesser mean operational speed (3.24 versus 4.10 km/h), 11.69% lesser effective time percentage of total time (60.0% versus 71.69%h/ha), 10.8% lesser mean field efficiency (64.3% versus 72.1%). In terms of total energy use the conventional combine showed 24.64% greater mean total energy use in the harvesting operation (1445.81 versus 1160.00 MJ/ha), 14.46% greater mean fuel energy (1010.014 versus 882.39 MJ/ha), 56.47% greater mean machinery energy (431.32 versus 275.65 MJ/ha) and 59.25% greater mean human energy (3.48 and 2.18 MJ/ha), this cause 26.12% greater mean total Green House Gas emission (GHG) than the mid-size combine. The results revealed that the mid-size combine is more suitable in conducting the harvest operation in rice field in Malaysia than the conventional combine.

Keyword: Environmental science